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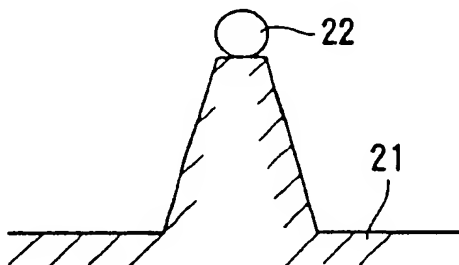
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(54) Ultra-fine microfabrication method using an energy beam

(57) An ultra-fine microfabrication method using an energy beam is based on the use of shielding provided by nanometer or micronmeter sized micro-particles to produce a variety of three-dimensional fine-structures which have not been possible to produce by the traditional photolithographic technique which is basically designed to produce two-dimensional structures. When the basic technique of radiation of energy beam and shielding is combined with a shield positioning tech-

nique using magnetic, electrical field or laser beam, with or without the additional chemical effects provided by reactive gas particles beams or solutions, fine-structures of very high aspect ratios can be produced with precision. Applications of devices having the fine-structure produced by the method include wavelength shifting in optical communications, quantum effect devices and intensive laser devices.

FIG. 3D





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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 4 407 695 A (DECKMAN HARRY W ET AL) * column 4, line 37 - column 6, line 43 * * claims 1-9; figures 1,2; example 2 *	1-3,6,8	H01L21/033 G03F7/00 H01L21/321 H01J9/02
X	US 4 664 748 A (UENO MASAKAZU ET AL) * column 2, line 21 - line 48 * * claims 1,2; figure 1 *	1,2,6,8	
X A	US 4 835 392 A (LOESCHNER HANS ET AL) * column 2, line 19 - line 38 * * column 5, line 46 - column 6, line 12 * * figure 1 *	8 9,10	
A	US 5 256 587 A (JUN YOUNG K ET AL) * column 1, line 47 - column 2, line 11 * * claims 1-4 *	1-3,6,8	
P,X	US 5 466 627 A (LUR WATER ET AL) * claims 1-6; figure 7 *	1,5,6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01L G03F H01J
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 January 1998	Examiner Hammel, E
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			